

CLAIMS

What is claimed is:

1. A method of reducing resist residue defects in a semiconductor manufacturing process, comprising:
 - performing a special vapor prime operation to a semiconductor substrate structure;
 - applying a photoresist coat to the semiconductor substrate structure;
 - selectively exposing a first portion of the photoresist coat using an exposure source and a photomask, wherein a second portion of the photoresist is unexposed;
 - performing a special development operation on the first portion of the photoresist using a developer;
 - removing the developed first portion of the photoresist from the structure; and
 - removing resist residues from the structure in order to reduce resist residue defects.
2. The method of claim 1, wherein the special vapor prime operation comprises using an HMDS type priming agent.
3. The method of claim 2, wherein the special vapor prime operation is performed at a low range of temperatures and for a relatively short time.
4. The method of claim 3, wherein the special vapor prime operation is performed from about 85 degrees C or more to about 130 degrees C or less, and for a time from about 5 seconds or more to about 20 seconds or less.
5. The method of claim 4, wherein performing the special development operation comprises maintaining a high exhaust air velocity.
6. The method of claim 5, wherein performing the special development operation comprises maintaining an exhaust air velocity from about 5 meters per

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second or more to about 6 meters per second or less.

7. The method of claim 5, wherein performing the special development operation comprises:

dispensing developer onto the semiconductor substrate structure:

rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period;

rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period;

rinsing the front side of the semiconductor substrate structure for a third time period; and

drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a high speed.

8. The method of claim 7, wherein rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period comprises rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at speed of about 1000 RPM for a first time period of about 40 seconds.

9. The method of claim 7, wherein rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period comprises rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 600 RPM for a second time period of about 8 seconds.

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10. The method of claim 7, wherein rinsing the front side of the semiconductor substrate structure for a third time period comprises rinsing the front side of the semiconductor substrate structure for a third time period of about 5 seconds.

11. The method of claim 7, wherein drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a high speed comprises drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 4500 RPM with a low acceleration of about 1000 RPM per second.

12. The method of claim 11, wherein rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period comprises rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at speed of about 1000 RPM for a first time period of about 40 seconds, wherein rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period comprises rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 600 RPM for a second time period of about 8 seconds, and wherein rinsing the front side of the semiconductor substrate structure for a third time period comprises rinsing the front side of the semiconductor substrate structure for a third time period of about 5 seconds.

13. The method of claim 1, wherein performing the special development operation comprises:

dispensing developer onto the semiconductor substrate structure;

rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time

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period;

rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period;

rinsing the front side of the semiconductor substrate structure for a third time period; and

drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a high speed.

14. The method of claim 13, wherein rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period comprises rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at speed of about 1000 RPM for a first time period of about 40 seconds.

15. The method of claim 13, wherein rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period comprises rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 600 RPM for a second time period of about 8 seconds.

16. The method of claim 13, wherein rinsing the front side of the semiconductor substrate structure for a third time period comprises rinsing the front side of the semiconductor substrate structure for a third time period of about 5 seconds.

17. The method of claim 13, wherein drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a high speed

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comprises drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 4500 RPM with a low acceleration of about 1000 RPM per second.

18. The method of claim 17, wherein rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period comprises rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at speed of about 1000 RPM for a first time period of about 40 seconds, wherein rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period comprises rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a speed of about 600 RPM for a second time period of about 8 seconds, and wherein rinsing the front side of the semiconductor substrate structure for a third time period comprises rinsing the front side of the semiconductor substrate structure for a third time period of about 5 seconds.

19. The method of claim 1, wherein the special vapor prime operation is performed at a low range of temperatures and for a relatively short time.

20. The method of claim 1, wherein the special vapor prime operation is performed from about 85 degrees C or more to about 130 degrees C or less, and for a time from about 5 seconds or more to about 20 seconds or less.

21. The method of claim 1, wherein performing the special development operation comprises maintaining an exhaust air velocity from about 5 meters per second or more to about 6 meters per second or less.

22. A vapor prime operation for a semiconductor manufacturing process.

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comprising: priming a semiconductor structure using an HDMS type priming agent at a temperature from about 85 degrees C or more to about 130 degrees C or less for a time period from about 5 seconds or more to about 20 seconds or less.

23. A development operation for a semiconductor manufacturing process, comprising:

dispensing developer onto a semiconductor substrate structure;

rinsing front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a medium speed for a first time period;

rinsing the front and back sides of the semiconductor substrate structure while spinning the semiconductor substrate structure at a low speed for a second time period;

rinsing the front side of the semiconductor substrate structure for a third time period; and

drying the semiconductor substrate structure while spinning the semiconductor substrate structure at a high speed.